International Standard ISO 5066/2

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Aircraft — Hermetically sealed monostable electrical relays, 2A and 3A — Part 2 : Type approval tests

Aéronefs — Relais électriques hermétiques monostables 2A et 3A — Partie 2 : Essais d'approbation de type

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ISO 5066/2-1986 (E)

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5066/2 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Contents

Aircraft — Hermetically sealed monostable electrical relays, 2A and 3A — Part 2 : Type approval tests

0 Introduction

ISO 5066 deals with hermetically sealed monostable electrical relays, 2A and 3A, and it is divided into two closely linked parts :

Part 1 : Operating characteristics and test conditions.

Part 2 : Type approval tests.

1 Scope and field of application

This part of ISO 5066 specifies the methods for type approval tests for hermetically sealed monostable electrical relays, 2A and 3A, for aircraft, the operating characteristics of which are specified in ISO 5066/1.

2 References

ISO 2315, *Aircraft — Two- and four-pole sealed electromagnetic relays, 2A and 3A — Clearance and fixing dimensions.*

ISO 5066/1, *Aircraft — Hermetically sealed monostable electrical relays, 2A and 3A — Part 1 : Operating characteristics and test conditions.*

3 Sampling, order of tests and test conditions

The type approval tests for hermetically sealed monostable electrical relays, 2A and 3A, shall be carried out in the conditions for sampling and testing as specified in ISO 5066/1.

The electrical relays shall be subjected to the tests in the order stipulated in table 8 in the annex of ISO 5066/1 and in accordance with clause 4 of this part of ISO 5066 as regards the preliminary checks and with clause 5 as regards type approval tests Nos. 1 to 20.

4 Preliminary checks

4.1 Appearance

The relays shall not display any fault which is visible to the naked eye under standard laboratory lighting.

4.2 Marking

The marking, as laid down in ISO 5066/1, shall be clearly legible.

4.3 Mass

The value measured shall conform to that given in the detail specification.

4.4 Dimensions

The values measured shall conform to those specified in ISO 2315.

5 Type approval tests

5.1 Test No. 1 : Resistance voltage

5.1.1 Procedure

Progressively apply an a.c. voltage up to the final value given in table 1 and maintain this voltage for 1 min between the different points of application specified in table 1.

Table 1 — Resistance voltage

Points of application	Resistance voltage	
	Ground conditions V	Conditions at an altitude of 24 000 m V
Between the case and the contacts	1 000	350
Between the case and the coil	500	
Between the contacts and the coil	1 000	
Between the contacts in the break and make positions	500	
Between the groups of contacts	1 000	

5.1.2 Test results

There shall be no rupture, perforation nor arc-over during application of the resistance voltage. The leakage current shall be less than 1 mA.

5.2 Test No. 2 : Insulation resistance

5.2.1 Procedure

Measure the insulation resistance after a d.c. voltage of 100 V has been applied for 1 min between

- the case and the contacts;
- the case and the coil;
- the contacts and the coil;
- the contacts in the break and make position;
- the group of contacts.

5.2.2 Test results

The values obtained shall not be less than those specified in 6.3 of ISO 5066/1.

5.3 Test No. 3 : Coil resistance

5.3.1 Procedure

Measure the coil resistance at an ambient temperature of 23 ± 3 °C, using a digital ohmmeter at low measuring current, in order to avoid any heating of the coil.

5.3.2 Test results

The values obtained shall be within the limits specified in 6.4 of ISO 5066/1.

5.4 Test No. 4 : Contact resistance

5.4.1 Procedure

Measure the contact resistance on the connectors, at 3 mm from the case, in the two positions, break and make, without the test current being applied during the change of condition, by applying

- a test current of 100 mA
- a test voltage of 6 V d.c.

5.4.2 Test results

Unless otherwise stated, the values obtained shall be less than or equal to those specified in 6.5 of ISO 5066/1.

5.5 Test No. 5 : Pick-up and drop-out voltages

5.5.1 Procedure

Pass a low-level current through the contacts connected to an appliance which permits the detection of the change in condition of the contacts. Then follow the appropriate procedure outlined in 5.5.1.1 or 5.5.1.2.

5.5.1.1 Pick-up voltage

Apply the rated voltage to the terminals of the coil for 1 to 3 s and then reduce gradually to zero. Then increase the voltage until the last contact changes position. Read off the voltage value at this point.

5.5.1.2 Drop-out voltage

Apply the rated voltage to the terminals of the coil and gradually reduce until the last contact changes position. Read off the voltage value at this point.

5.5.2 Test results

The values obtained shall conform with those specified in 6.6 of ISO 5066/1.

5.6 Test No. 6 : Make and break times

5.6.1 Procedure

Connect the contacts, through which a low-level current is passed, to an oscilloscope, as shown in figure 2 (see the annex) or an equivalent assembly. As the rated voltage is applied to the terminals of the coil, read off the make and break times before the contact bounce.

5.6.2 Test results

The values obtained shall not exceed those specified in 6.7 of ISO 5066/1.

5.7 Test No. 7 : Contact bounce times

5.7.1 Procedure

Use the same assembly as specified for test No. 6 (see figure 2). Record the times between the first make and the definitive formation of the contact in the different conditions.

5.7.2 Test results

The values obtained shall not exceed those specified in 6.8 of ISO 5066/1.

5.8 Test No. 8 : Endurance

5.8.1 Procedure

The values of voltage and current passing through the contacts undergoing this test shall be as specified in 6.2 of ISO 5066/1, depending on whether the test is carried out at rated current or low current.

The coils shall be energized by well-strobe markers having rated voltage at a rate of 20 cycles/min for the rated current test and from 60 to 300 cycles/min for the low current test.

The operating cycles shall be distributed as follows :

— 25 % of the total number of cycles carried out at a temperature between + 15 and + 30 °C;

— 5 % of the total number of cycles carried out at the minimum operating temperature;

— 40 % of the total number of cycles carried out at the maximum operating temperature;

— 30 % of the total number of cycles carried out at a temperature between + 15 and + 30 °C.

Carry out 100 000 cycles for the samples subjected to the rated current test and 1 000 000 cycles for those subjected to the low voltage test.

Constantly check the values for contact resistance throughout the test.

At the end of the test, carry out the following measurements :

a) resistance voltage, in accordance with test No. 1 (see 5.1);

b) insulation resistance, in accordance with test No. 2 (see 5.2);

c) contact resistance, in accordance with test No. 4 (see 5.4);

d) pick-up and drop-out voltages, in accordance with test No. 5 (see 5.5);

e) make and break times, in accordance with test No. 6 (see 5.6);

f) contact bounce times, in accordance with test No. 7 (see 5.7).

5.8.2 Test results

The values obtained from these measurements shall satisfy the respective requirements specified for those tests referred to in 5.8.1 a) to 5.8.1 f).

5.9 Test No. 9 : Overload

5.9.1 Procedure

The coils shall be energized by well-strobe markers having rated voltage at a rate of 20 cycles/min. A current with a value of twice the rated value shall be passed through the contacts.

Subject the samples to 100 cycles and constantly check them for any defect in the make or the pick-up of the contact.

At the end of the test, measure the contact resistance.

5.9.2 Test results

The contact resistance values shall not exceed the value specified in 6.5 of ISO 5066/1.

5.10 Test No. 10 : Internal moisture content

5.10.1 Procedure

Expose the relay to 125 °C for 1 h, with the coil unenergized, then for 1 h, with the coil energized under rated voltage (U_{nom}). Finally expose the relay to − 65 °C for 1 h with the coil energized under U_{nom}.

Carry out the following measurements during testing :

a) During the first hour at + 125 °C :

— pick-up and drop-out voltages, in accordance with test No. 5 (see 5.5).

b) During the third hour at − 65 °C :

— pick-up and drop-out voltages, in accordance with test No. 5;

— contact resistance, in accordance with test No. 4 (see 5.4), the measurement being carried out on unenergized contacts after the supply to the coil has been removed.

5.10.2 Test results

The values obtained during measurement shall satisfy the respective requirements specified for those tests referred to in 5.10.1 a) and 5.10.1 b).

5.11 Test No. 11 : Hermetic seal

5.11.1 Procedure

Keep the relays for 8 h at a helium pressure of 4 bar[1] absolute. After allowing the relays to stand for 5 min in ambient

1) 1 bar = 10^5 Pa (exactly)

laboratory conditions, measure the gas leakage by means of a mass spectrometer.

NOTE — Any other equivalent test appliance may be used and, in particular, one which can be applied to relays which are filled with a mixture of helium and protective gas.

5.11.2 Test results

The leakage rate measured shall not exceed that specified in 4.3 of ISO 5066/1.

5.12 Test No. 12 : Rapid variations in temperature

5.12.1 Procedure

Subject the relays to 5 cycles of rapid variations in temperature, each cycle being constituted as follows :

— 30 min at − 65 °C;

— 5 min at + 25 °C;

— 30 min at + 125 °C;

— 5 min at + 25 °C.

During the fifth cycle, maintain the extreme temperatures for 2 h, and, during these 2 h, carry out the following measurements :

a) insulation resistance, in accordance with test No. 2 (see 5.2);

b) contact resistance, in accordance with test No. 4 (see 5.4);

c) pick-up and drop-out voltages, in accordance with test No. 5 (see 5.5);

d) make and break times, in accordance with test No. 6 (see 5.6);

e) contact bounce times, in accordance with test No. 7 (see 5.7).

5.12. Test results

The values obtained from these measurements shall satisfy the respective requirements specified for those tests referred to in 5.12.1 a) to 5.12.1 e).

5.13 Test No. 13 : Humidity

5.13.1 Procedure

Expose the relays for 56 days to an atmosphere of 90 $^{+5}_{0}$ % relative humidity and a temperature of 40 ± 2 °C.

At the end of the test, carry out the following measurements :

a) insulation resistance, in accordance with test No. 2 (see 5.2);

b) resistance voltage, in accordance with test No. 1 (see 5.1).

5.13.2 Test results

The values obtained from these measurements shall satisfy the respective requirements specified for those referred to in 5.13.1 a) and 5.13.1 b).

5.14 Test No. 14 : Salt spray

5.14.1 Procedure

Subject the relays to a salt spray test, as follows :

a) expose them to the salt spray [an aqueous solution of 5 % (m/m) of sodium chloride (NaCl)] for 24 or 48 h, depending on whether the connectors are gilded or galvanized;

b) rinse in running water;

c) dry for 48 h in ambient laboratory conditions.

5.14.2 Test results

The relays shall display no trace of corrosion likely to be detrimental to their satisfactory operation.

5.15 Test No. 15 : Shock

5.15.1 Procedure

Connect the contacts, through which a current of 10 mA and a voltage of 6 V are passing, to a micro break detector.

Subject the relays to three shocks in each of the two directions of the three trirectangular axes, with the contacts in the break position and the make position, i.e. 36 shocks in all, having an acceleration of 100g, lasting for 6 ms and of a semi-sinusoidal form.

At the end of the test, carry out the following measurements :

a) resistance voltage, in accordance with test No. 1 (see 5.1);

b) insulation resistance, in accordance with test No. 2 (see 5.2);

c) contact resistance, in accordance with test No. 4 (see 5.4);

d) pick-up and drop-out voltages, in accordance with test No. 5 (see 5.5);

e) make and break times, in accordance with test No. 6 (see 5.6);

f) contact bounce times, in accordance with test No. 7 (see 5.7).

5.15.2 Test results

The values obtained from these measurements shall satisfy the requirement specified in 4.4 of ISO 5066/1 as well as the respective requirements specified for those tests referred to in 5.15.1 a) to 5.15.1 f).

5.16 Test No. 16 : Sinusoidal vibrations

5.16.1 Procedure

Connect the contacts, through which a current of 10 mA and a voltage of 6 V are passing, to a micro break detector.

Vibrate the relays, in each of the three trirectangular axes, for 2 h in the break position and 2 h in the make position for each axis, i.e. a total of 12 sweeps per axis, performed in conformity with the requirements specified in table 2.

Table 2 — Sinusoidal vibrations

Frequency, f Hz	Displacement mm	Acceleration g	Duration per axis min
$10 \leqslant f \leqslant 55$	± 2,5	—	20
$55 < f \leqslant 3\,000$	—	30	

At the end of the test, carry out the following measurements :

a) resistance voltage, in accordance with test No. 1 (see 5.1);

b) insulation resistance, in accordance with test No. 2 (see 5.2);

c) contact resistance, in accordance with test No. 4 (see 5.4);

d) pick-up and drop-out voltages, in accordance with test No. 5 (see 5.5);

e) make and break times, in accordance with test No. 6 (see 5.6);

f) contact bounce times, in accordance with test No. 7 (see 5.7).

5.16.2 Test results

The values obtained from these measurements shall satisfy the requirement specified in 4.4 of ISO 5066/1 as well as the respective requirements specified for those tests referred to in 5.16.1 a) to 5.16.1 f).

5.17 Test No. 17 : Acceleration

5.17.1 Procedure

Connect the contacts, through which a current of 10 mA and a voltage of 6 V are passing, to a micro break detector.

Subject the relays to an acceleration of 50g in each of the two directions of the three trirectangular axes, for 5 min in the break position and 5 min in the make position.

Before the changes in condition of the contacts, measure the pick-up and drop-out voltages in accordance with test No. 5 (see 5.5).

5.17.2 Test result

The values obtained from these measurements shall satisfy the requirement specified in 4.4 of ISO 5066/1 as well as the requirements specified for test No. 5.

5.18 Test No. 18 : Solderability (bath method)

5.18.1 Procedure

After application of the flux (where necessary) at laboratory temperature, immerse the connectors in the solder bath, maintained at a temperature of 235 ± 5 °C, at a speed of 25 ± 5 mm per second and up to 3 mm from the base of the relay.

After immersing for 5 ± 0,5 s, take the pieces out of the bath at a rate of 25 ± 5 mm per second.

5.18.2 Test results

The connectors shall be tinned correctly.

5.19 Test No. 19 : Strength of outlets (tensile test)

5.19.1 Procedure

With the outlet in its usual position and the relay supported by its body, gradually and evenly apply a force of 10 N in the direction of the outlet axis and maintain this for 10 ± 1 s.

All the outlets of the same relay shall be subjected to a single test.

5.19.2 Test results

There shall be no deterioration in the outlet or sealing socket.

5.20 Test No. 20 : Magnetic interference

5.20.1 Procedure

Fix, in the same direction and using non-magnetic fixings, as shown in figure 1, the relay being tested and eight other similar relays. The magnetic polarity of each relay shall have the same orientation.

Measure pick-up and drop-out voltages, in accordance with test No. 5 (see 5.5), on the test relay, with the coils of the surrounding eight relays energized under U_{nom} and then unenergized.

5.20.2 Test results

The values obtained shall conform with those specified in 6.6 of ISO 5066/1.